

RECEIVED
CENTRAL FAX CENTER
AUG 24 2009

Serial No.: 10/541,622
Examiner: Stephen J. Yanchuk
Reply to Office Action Mailed June 8, 2009
Page 2 of 8

Amendments to the Claims:

This listing of claims will replace all prior versions, and listing, of claims in the application.

1. (Currently amended) A separator material that is a sulfonated nonwoven that comprises:

a polyolefin ultra-fine short fiber having a fineness of less than 0.5 dtex, and other polyolefin short fibers,

wherein the other polyolefin short fibers include a polyolefin thermal bonding short fiber, and

component fibers comprise at least a portion of the polyolefin thermal bonding short fiber fibers are bonded together, and at least a portion of the polyolefin thermal bonding short fiber is flattened to bond the component fibers together, and

the nonwoven has a specific surface area in a range of 0.6 m²/g to 1.5 m²/g and satisfies the following ranges:

(1) a ratio (S/C)_E of the number of sulfur atoms (S) to the number of carbon atoms (C) in the nonwoven, as measured by Electron Spectroscopy for Chemical Analysis (ESCA), is in a range of 5×10^{-3} to 60×10^{-3} ;

(2) a ratio (S/C)_B of the number of sulfur atoms (S) to the number of carbon atoms (C) in the nonwoven, as measured by a flask combustion technique, is in a range of 2.5×10^{-3} to 7×10^{-3} ; and

(3) a ratio (S/C)_E/(S/C)_B (depth of sulfonation) of (S/C)_E to (S/C)_B is in a range of 1.5 to 12.

2. (Original) The separator material according to claim 1, wherein a depth of sulfonation is in a range of 1.5 to 9.

3. (Original) The separator material according to claim 1, wherein a tensile strength in a longitudinal direction of the nonwoven is 100 N/5cm or more as measured in accordance with JIS-L-1096.

Serial No.: 10/541,622
Examiner: Stephen J. Yanchuk
Reply to Office Action Mailed June 8, 2009
Page 3 of 8

4. (Original) The separator material according to claim 1, wherein, in a thickness direction of the nonwoven, a proportion of the flattened fiber constituting a surface layer portion of the nonwoven is larger than that of an inner portion of the nonwoven.
5. (Original) The separator material according to claim 1, wherein, when an amount of the nonwoven is assumed to be 100 parts by mass, an amount of the polyolefin ultra-fine short fiber is in a range of 20 parts by mass to 80 parts by mass, and an amount of the other polyolefin short fibers is in a range of 80 parts by mass to 20 parts by mass, and among the other polyolefin short fibers, a polyolefin thermal bonding short fiber is included in a range of 50mass % to 90mass%.
6. (Original) The separator material according to claim 1, wherein the other polyolefin short fibers include a polyolefin high-strength short fiber having a fiber strength of 5 cN/dtex or more in addition to the polyolefin thermal bonding short fiber.
7. (Original) The separator material according to claim 1, wherein the polyolefin ultra-fine short fiber has a fineness in a range of 0.03 dtex to 0.3 dtex.
8. (Currently amended) The separator material according to claim 1, wherein the polyolefin ultra-fine short fiber is a short fiber formed of a split obtained by splitting at least a portion of a splittable composite short fiber.
9. (Original) The separator material according to claim 8, wherein the splittable composite short fiber comprises a polymethylpentene resin as one component.
10. (Original) The separator material according to claim 1, wherein the other polyolefin short fiber has a fineness in a range of 0.5 dtex to 5 dtex.

Serial No.: 10/541,622
Examiner: Stephen J. Yanchuk
Reply to Office Action Mailed June 8, 2009
Page 4 of 8

11. (Currently amended) The separator material according to claim 1, wherein the nonwoven is a hydroentangled wetlaid nonwoven that is obtained by a hydroentangling process.

12. (Original) The separator material according to claim 1, wherein the sulfonation is introduction of functional groups containing sulfur atoms using SO₃ gas.

13-20. (Canceled)

21. (Currently amended) An alkali secondary battery separator comprising:
a separator material that is a sulfonated nonwoven that comprises a polyolefin ultra-fine short fiber having a fineness of less than 0.5 dtex, and
other polyolefin short fibers,
wherein the other polyolefin short fibers include a polyolefin thermal bonding short fiber, and

component fibers comprise at least a portion of the polyolefin thermal bonding short fiber fibers are bonded, and at least a portion of the polyolefin thermal bonding short fiber is flattened to bond the component fibers together,

the nonwoven has a specific surface area in a range of 0.6 m²/g to 1.5 m²/g and satisfies the following ranges:

(1) a ratio (S/C)_E of the number of sulfur atoms (S) to the number of carbon atoms (C) in the nonwoven, as measured by Electron Spectroscopy for Chemical Analysis (ESCA), is in a range of 5×10⁻³ to 60×10⁻³;

(2) a ratio (S/C)_B of the number of sulfur atoms (S) to the number of carbon atoms (C) in the nonwoven, as measured by a flask combustion technique, is in a range of 2.5×10⁻³ to 7×10⁻³; and

(3) a ratio (S/C)_E/(S/C)_B (depth of sulfonation) of (S/C)_E to (S/C)_B is in a range of 1.5 to 12.